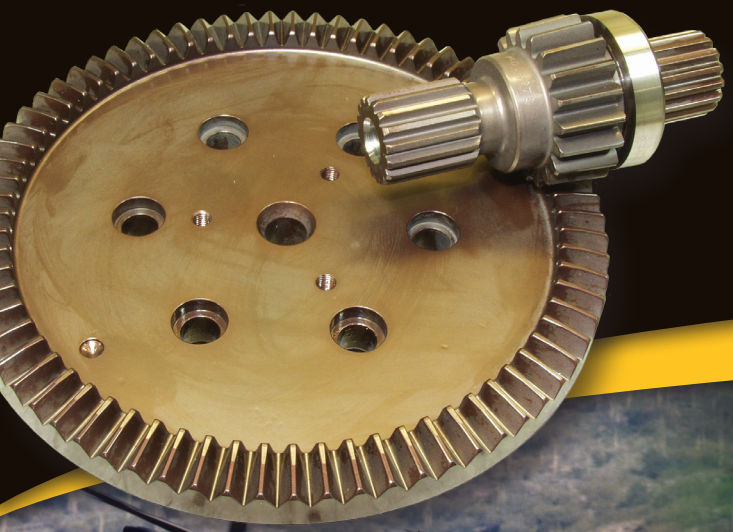
HONORING THE ACHIEVEMENTS OF TODAY. BUILDING ON INNOVATION FOR TOMORROW.



VTD

VEHICLE TECHNOLOGY DIRECTORATE

U.S. ARMY RDECOM®

ARL

U.S. ARMY RESEARCH LABORATORY

ACCOMPLISHMENTS

FACE GEAR

March 13, 2012

Almost 20 years ago, the Army Research Laboratory helped to discover a revolutionary way to increase transmission power in the Apache helicopter without increasing the transmission's size or weight. That innovation is split-torque face gear technology, and it's now inside the Improved Drive System of the new Apache Block III helicopter that began delivery in October 2011. The current Army objective is to field 690 AH-64D Apache Block III helicopters over the next 15 to 20 years. The initial production phase calls for 74 transmissions plus initial spares.

With split-torque face gear technology, helicopters can now have more power without becoming heavier or bigger. These face gears are also being studied for use in other helicopter drive applications beyond Apache Block III.

ARL holds the institutional knowledge on face gear research and development, and on how to approach new, high-risk technologies, perform the basic and applied research tasks required for proving the concepts, and then transitioning those to the appropriate research, development and engineering center for development. This knowledge has enabled ARL to pursue other high-risk propulsion technologies in the areas of condition-based maintenance, advanced drives materials, and surface engineering techniques.

SEPTER

March 1, 2012

ARL has embarked upon a research project that no one is believed to be looking into that's considering surface engineering treatment remedies to reduce fuel costs. VTD's Propulsion Division is leading an Army-wide effort to determine how simple surface improvements to automotive components can effectively improve automotive efficiency. They've teamed with a group of experts at Ohio State University as well as within a number of military organizations to investigate whether surface engineering techniques can yield tangible gains in power transfer efficiency within military vehicle drive trains. That could mean the Army would not only save money, it could help save the environment.

The project is called Surface Engineering for Propulsion and Transmission Energy-loss Reduction (SEPTER), and it consists of a wide range of basic and applied research topics to determine how well different surface treatments increase efficiency. The project is funded by the Assistant Secretary of Defense for Research and Engineering. Engineering techniques that will be investigated include super finishing and the application of nickel-based coatings.

ARL-CREATED SOFTWARE HELPS ANALYSTS PREDICT CRASH LANDING SURVIVABILITY

Nov. 28, 2011

The Army Research Laboratory is advancing the way the military looks at vehicle survivability and vulnerability today to better focus its research efforts on reducing injury to rotorcraft crew and passengers.

ARL developed a software solution in 2005 to provide a new capability to look at survivability with power loss. That software, DESCENT, is an iterative optimization algorithm that has been applied to rotorcraft flight modeling. DESCENT reports help survivability/lethality analysts ascertain how well the helicopter will survive a crash landing from a given height or flight speed if it loses power because of engine failure. They're trying to find the best-case scenario to determine how gently the pilot might be expected to land, how much damage is incurred and whether or not the crash is survivable.

The ARL team is working with the Joint Aircraft Survivability Program Office to verify and validate the code, and model different types of rotorcraft. The Joint Aircraft Survivability Program Office ensures that the United States continues to field survivable, combat effective aircraft systems sufficient to maintain battle space dominance.

UPDATED ARMY-BUILT SOFTWARE EXPANDS SURVIVABILITY ANALYSIS OF HELICOPTER CREW, PASSENGER INJURY

Apache crewmember who is preparing the helicopter for takeoff.

Aug. 4, 2011

Injury to passengers and crews are becoming more of a focus in newly expanded studies of helicopter survivability, U.S. Army Research Laboratory researchers say, and this foray into broadening vehicle vulnerability analysis gives the military a truer picture of what happens mid-flight when a helicopter is at risk of crashing.

In the past when the military analyzed the survivability of a helicopter, the primary focus was on the specific types of threats the vehicle was exposed to in combat, or if one of its engines failed, how the helicopter could still fly, for how long and how high. As a matter of routine, occupants who are not part of critical mobility or firepower systems are not considered in every aspect Army modeling that attempts to determine the 'survivability' of a weapon system. That makes sense, experts say, because occupants don't all have the same impact on the system's ability to complete a combat mission under enemy fire. Only the pilot is absolutely needed to fly and safely land aircraft.

But broadening the scope of different types of vulnerability and survivability tests to include how helicopter passengers and crews may be injured is 'refreshing.'

As a matter of course, occupant injury is an integral part of studies in Army helicopter design from armor thickness to seat placement, but "the emphasis on expanding the scope of occupant injury assessment to all aspects of survivability/vulnerability analysis means new roles, and requirements, for many of the Army's analysis modeling tools," said Andrew Drysdale, aerospace engineer in ARL's Survivability/Lethality Analysis Directorate (SLAD).

UPDATED ARMY-BUILT SOFTWARE EXPANDS SURVIVABILITY ANALYSIS OF HELICOPTER CREW, PASSENGER INJURY, continued

The broadened focus on occupant outcomes, he said, highlights additional failure modes and performance limitations, and zeroes in on additional factors key to understanding whether a new system will actually provide improved military capability.

ARL aerospace scientists say this expanded scope could mean military experts will get analysis results quicker and conduct vulnerability evaluations in a shorter time to, in turn, come up with optimal flight paths at the ideal speed to help pilots minimize ground impact, or crash landings.

Software ARL developed in 2005 by Dr. Matthew Floros, a research aerospace engineer in ARL's Vehicle Technology Directorate (VTD), was recently updated to expand how crew and passengers are integrated in broader vehicle survivability assessments. When the software was initially introduced, it provided a new capability that looked survivability with power loss. The latest development could mean military experts will get information quicker and can perform vulnerability evaluations in a shorter time.

"Initially, I wrote a code that was only complete power loss then we expanded it to deal with partial power and pilot delay. There were several improvements we made to it as we went along," said Floros. "The recent changes have been to optimize this flight path."

With his efforts, pilots could conceivably have a list of "if/then" scenarios to minimize damage to the vehicle and injury to the crew and passengers.

DESCENT is an iterative optimization algorithm that has been applied to rotorcraft flight modeling. The code takes a helicopter of user-defined characteristics and flight conditions and uses an in-plane rotorcraft aerodynamics model, which looks at longitudinal and vertical translation, fuselage pitch rotation, to approximate a "baseline" impact velocity assuming that the initial control levels are unchanged from the moment of power loss to the moment of impact.

It then perturbs each of the degrees of freedom, or controls available to the pilot, to find a control time-history that improves on the baseline impact velocity. Then, as an iterative process, the new scenario becomes the baseline and further refinement in the pilot control schedules is sought.

DESCENT output is used to help survivability/lethality analysts ascertain how well the helicopter will survive a crash landing from a given height or flight speed if it loses power because of engine failure, Floros said.

Reports from this software help survivability/lethality analysts ascertain how well the helicopter will survive a crash landing from a given height or flight speed if it loses power because of engine failure.

The Army is trying to find the best-case scenario to determine how gently the pilot might be expected to land, how much damage is incurred and whether or not the crash is survivable, he said.

ARL looks at a helicopter, for example, flying under certain flight conditions then it experiences some type of power loss like in-flight power loss or loss of an engine. SLAD examines the many ways a helicopter could lose power. The VTD's Vehicle Applied Research Division takes as input into the code those flight conditions and how much power remains after an event to generate the optimal flight path.

ARL experts use engineering judgment to determine the probability that a weapon system will be killed if it's shot in a certain place with a certain threat. The summation of this determination for all possible shot lines is called the vulnerability analysis assessment.

"The methods we had for defining vulnerability in the past were unsatisfactory because they relied on looking at really only the ability of the vehicle to land without damage to itself or to critical systems," Drysdale said. "So creating a more comprehensive set of metrics that looks at not only does the vehicle survive the impact but do the occupants also fare as well as the vehicle does lets us more effectively serve that mission.

ARL produces vulnerability analyses for Army air vehicles as part of the design and evaluation process. The SLAD holds the congressional mandate for Live Fire Test and Evaluation (LFT&E) of all Army Aviation platforms. These analyses quantify the vulnerability of new, newly upgraded and legacy vehicles as part of an overall assessment of their effectiveness.

Experts use models that look at penetration, damage and fault logic to determine if the mission should be aborted and the vehicle returned to base, forced to land immediately to prevent catastrophic damage or if the vehicle has sustained irreparable destruction.

The ARL team is currently working with the Joint Aircraft Survivability Program Office to incorporate a new optimal control algorithm, and, verify and validate the code, and model different types of rotorcraft. The Joint Aircraft Survivability Program Office ensures that the United States continues to field survivable, combat effective aircraft systems sufficient to maintain battle space dominance.

RECOGNITION

VTD ROTORCRAFT AEROELASTICITY TEAM LEAD RECEIVES HELICOPTER SOCIETY HONOR

Matt Wilbur, third row, third from right, is shown with the Triple Helix team. (Courtesy Photo)

Feb. 15, 2012

Matthew Wilbur, a senior research engineer who leads ARL's Vehicle Technology Directorate's Aeroelasticity Team, was recently awarded the American Helicopter Society Hampton Roads Chapter John W. White Engineer of the Year Award.

The American Helicopter Society International is the world's oldest and largest professional society dedicated to enhancing the understanding of vertical flight technology. The society was established in 1943, around the time the first U.S. helicopter was being put into service. According to its website, the Society has been the primary forum for interchange of information on vertical flight technology.

Wilbur, who is based at NASA-Langley, was recognized for outstanding contributions to the advancements of both military and civilian helicopters and service to the Hampton Roads Chapter of the American Helicopter Society International, as stated on the award citation.

He was also recognized for his contributions to rotary-wing technology while conducting research activities at the Langley Transonic Dynamics Tunnel — such as the development of active helicopter rotor systems — as well as his involvement with STEM education activities. Wilbur mentors Hampton Roads-area students as head coach for the Menchville High School Robotics Team, *Triple Helix*, in Newport News, Va.

Triple Helix, the Menchville Robotics Team, began competing as *FIRST* Robotics Competition Team 2363 in 2008. Since that time, the team has amassed ten *FIRST* (For Inspiration and Recognition of Science and Technology) awards, including the Woodie Flowers Regional Finalist Award, which was presented to Wilbur in March 2011 at the *FIRST* Virginia Regional in Richmond, Va. The Woodie Flowers Finalist Award is presented at each regional competition to the mentor that best exemplifies effective communication in the art and science of engineering and design.

FIRST awards to *Triple Helix* include:

- 2008 NASA/VCU Regional Rookie Inspiration Award
- 2009 NASA/VCU Regional Underwriters' Laboratory Industrial Safety Award
- 2010 Washington DC Regional Underwriters' Laboratory Industrial Safety Award
- 2010 Virginia Regional Motorola Quality Award
- 2011 Palmetto Regional Winners
- 2011 Palmetto Regional Engineering Excellence Award
- 2011 Virginia Regional Finalists
- 2011 Virginia Regional Industrial Design Award
- 2011 Virginia Regional Woodie Flowers Finalist Award
- 2011 Virginia Regional *FIRST* Dean's List Award

COLLABORATION

ROTORCRAFT, PLASMA EXPERTS MET AT VTD-PLANNED WORKSHOP ON MATURING ROTORCRAFT PERFORMANCE TECHNOLOGY

Dr. Bryan J. Glaz, ARL research aerospace engineer

Nov. 10, 2011

The Vehicle Technology Directorate of the Army Research Laboratory led a workshop with DARPA Oct. 11-12 at the System Planning Corporation, in Arlington, Va., to develop a cohesive plan that incorporates government, industry and academic interests in maturing plasma actuation into a new technology that will advance Department of Defense rotorcraft performance beyond current capabilities.

ARL is looking into the use of plasma-actuation, which could impact DARPA's Mission Adaptive Rotor (MAR) program's ongoing investigation of smart structures and aerodynamic flow control approaches to improve rotorcraft capabilities.

Workshop planner Dr. Bryan J. Glaz, an ARL research aerospace engineer, said plasma actuators appear to immediately address some key attributes of on-blade actuation. "They're lightweight, have low to no volume, and are durable. These are critical aspects since technologies that add too much weight interfere with blade structural dynamic design, or that cannot survive the loads that rotor blades are subjected to will not buy their way onto mainstream fleet vehicles. In addition to enhancing rotor thrust, they could also potentially be used to reduce vibratory loads or acoustic signature since they have high bandwidth performance far above rotor rpm, or revolutions per minute.

This workshop was a proverbial "meeting of the minds", and brought together rotorcraft experts with plasma experts to discuss new developments.

According to DARPA's website, the MAR program seeks to dramatically improve system performance, operational availability, sustainability, and survivability of rotorcraft, including reduction in acoustic susceptibility and rotor vibration while increasing useful payload fraction and range. The goal is to develop and demonstrate the capability to achieve these improvements through the use of technologies that enable adaptation of the rotor throughout military missions and/or mission segments.

Glaz said "although aerodynamic flow control has long been recognized as necessary for achieving substantial breakthroughs in rotor blade aerodynamic performance, no on-blade flow control technologies are currently fielded because they weigh too much, consume too much power, and/or are ineffective at full-scale aerodynamic conditions."

He said plasma based flow control is "attractive because the weight and power penalties would be very low."

ARL's Vehicle Technology Directorate is interested in a new way of using plasma actuators that shows potential for working under the aerodynamic flow conditions associated with full-scale rotor blades, he said.

"The ideas that VTD is interested in are new and have not yet been fully investigated. There is substantial work that needs to be done in order to determine if plasma will be a new active rotor technology," Glaz said. "So we are working with DARPA and other government agencies (Army, Navy, and NASA) to determine how we can combine resources to mature this technology. There is substantial interest from the other government agencies, industry, and academia because everyone recognizes the impact to future rotorcraft capabilities if successful."

ARL PARTICIPATES IN ANNUAL AMERICAN HELICOPTER SOCIETY FORUM

June 11, 2010

ARL scientists and engineers recently participated in the American Helicopter Society's 66th Annual Forum & Technology Display, May 10-14 in Phoenix, Ariz.

This year's theme was "Rising to New Heights in Vertical Flight Technology." The forum provided the opportunity for a joint team from VTD, WMRD and CISD, along with partners from the U.S. Army Aviation and Missile Research Development and Engineering Center, to showcase a 20 by 30 foot technical exhibit that showcased relevant RDECOM R&D programs to rotorcraft platforms.

According to Steve Taulbee, a general engineer in WMRD's Office of the Director, the gathering represented an invaluable opportunity for ARL staff.

"The forum identified key areas of research and development and brought key players together to collaborate on critical technologies for rotorcraft platforms," he noted.

Taulbee added that the forum helped inform a wider audience about the significant progress that has been made in materials and lightweight protection research of potential application to rotorcraft and other low-altitude battlespace platforms.

The joint ARL-AMRDEC exhibit featured ARL's research in materials and protection. These included WMRD's efforts in transparent armor, lightweight head protection, graphite 3-D laminates, and ultralight opaque armor; CISD research in battlefield environment effects and high performance computing; and VTD advances in active twist rotor technology and geared components.

The AMRDEC portion featured Army aviation R&D programs at the Aviation Applied Technology Directorate (AATD) and the Aeroflightdynamics Directorate.

Taulbee noted that there was significant interest in the ARL demos among the attendees. ARL scientists and engineers interacted with representatives from the Naval Air Systems Command, the Air Force Research Lab, NASA, academia, and industry, including Boeing, Bell Helicopter Textron, Sikorsky, United Technologies Research Center, BAE Systems, Pratt and Whitney, and Rolls Royce.

Next year's AHS forum has been scheduled for May 3-5, 2011 in Virginia Beach, Va.

MENTORING

ARL RESEARCHERS JUDGED WORLD'S LARGEST SCIENCE COMPETITION FOR TEENS

International Science and Engineering Fair® - a program of - Society for Science & the Public

June 7, 2011

Dr. Jaret Riddick, a research aerospace engineer in ARL's Vehicle Technology Directorate, and Dr. Larry Russell, technical assistant to the ARL director, participated as invited special award judges in the Engineering Section of the Annual Intel® International Science and Engineering Fair® (Intel ISEF). In this capacity, they represented the Department of the Army's interest.

The Intel ISEF®, the world's largest international pre-college science competition, provides an annual forum for more than 1,500 high school students from 65 countries, regions, and territories to showcase their independent research. The Intel ISEF is the premier global science competition for students in grades 9-12.

With projects focused on research directly applicable to Army challenges, 16-year-old Marian Bechtel of Hempfield High School in Landisville, Pa., was named a second award winner for her project "A Stand-Off Seismo-Acoustic Method for Humanitarian Demining." Runner-up Austin Duff, of Gaithersburg, Md., focused his project on the "Development of a Scalable Software Architecture for the Efficient Production of Interactive and Responsive Robotic Behavior."

"Marian's (work) in the stand-off detection of explosives correlates directly with the fiscal year 2011 Big Five Warfighter Outcomes while Austin's work presented a novel method to enhance robot autonomy," Riddick stated. Both students were featured in a CBS News segment.

"The fact that their research is highlighted from among all present should be seen as a testament to the fact that Army-focused problems are at the forefront of technology needs internationally, and represent key opportunities to inspire young people to pursue science and technology interests that will breed America's next generation of leading researchers," Riddick said.

Society for Science and the Public, a nonprofit organization dedicated to public engagement in scientific research and education, owns and has administered the International Science and Engineering Fair since its inception in 1950. Intel ISEF Special Awards are presented by nearly 70 scientific, professional and educational organizations, and include scholarships, summer internships, equipment grants, and trips.

The Intel International Science and Engineering Fair finalists are evaluated onsite by hundreds of judges from nearly every scientific discipline, each with a Ph.D. or the equivalent of six years of related professional experience in one of the scientific disciplines.

WIN SOME, LOSE SOME, STILL VICTORIOUS:

ROBOTICS TEAM COACHED BY ARL ENGINEER SCORES HIGH ON TEAMWORK DURING RECENT COMPETITION LOSS

Team 2363, Triple Helix, coached by Matt Wilbur, Army Research Laboratory engineer, in competition March 15-17 in Richmond, Va.

April 4, 2012

The FIRST Robotics Team that Matt Wilbur coaches posted blow-by-blow updates via Twitter, a popular social networking site, on their recent competition - and last minute loss - at the FIRST (For Inspiration and Recognition of Science and Technology) Virginia Regionals held March 15 - 17 at Virginia Commonwealth University's Siegel Center in Richmond.

Wilbur is an engineer in the Vehicle Technology Directorate of the Army Research Laboratory at Langley.

Although they walked away without a team prize, they scored high in teamwork, he said.

"Sticking together to identify a solution required a lot of teamwork," Wilbur said. "Finger pointing and passing the buck would have done no one on the team any good."

He said his team learned the harsh lesson that "sometimes unknown outside factors can spoil the best laid plans. This is an excellent life lesson to learn at such an early age. All of the students or the mentors on the team walked out of the arena with their heads held high, and looking forward to the opportunity for redemption at the North Carolina Regional in Raleigh, April 5 - 7."

Wilbur's daughter, Rachel, a senior who serves as team captain, was one of two students selected at the competition as a Dean's List Finalist Award winner, which landed an opportunity for one of the 10 awards to be bestowed on Dean's List students at the national championship in St. Louis in April 25 - 28. The award is given annually to students who best exemplify FIRST ideals and are effective at inspiring others to excel. The award is named after FIRST founder Dean Kamen.

Before the team left Menchville, which is about 70 miles south of Richmond, Wilbur's note to a couple dozen supporters encouraged a strong fan showing in the midst of grateful sentiments: "We very much appreciate the support of all of our sponsors, friends and fans."

The competition involved a robotic basketball tournament that tested their engineering, teamwork and alliance-building skills. The contest brought together 59 teams from Virginia, The Carolinas, Connecticut and Washington, D.C. to face off at the Siegel Center. Top performers at the Virginia Regional qualified to compete at the FIRST Championship in St. Louis.

Midday Friday, the team's Twitter posting read: "Triple helix on a roll thanks to great teammates." At 20 minutes 'til 11 Saturday morning, the team posted, "We're in our final quarter final match, wish us luck!!!!" Just 12 minutes later, "Awww 34-41, they got us at the last couple seconds."

Wilbur said the competition "did not come easy for us this year. The team fought very hard to remain near the top of the standings under some difficult circumstances. There is an old saying that you learn more from your failures than from your successes, and this holds true in this particular case.

"Though the team had worked hard to develop a robot that could accurately shoot 3-pointers using a sophisticated camera range and direction finding system, it was all crippled by scoreboards that were brightly lit at

each end of the playing field. Working through these issues to isolate the problem and come up with a suitable solution kept the team on their toes. In the end, a solution to the problem was identified, but it was a little bit too late to tune things up to the point where the 3-pointers were falling consistently enough to take us to the top of the competition."

High school teams from Henrico County, Martinsville, Va. and Raleigh, N.C. emerged Saturday as top winners

Last year, Triple Helix won the 2011 Palmetto Regional Winners, 2011 Palmetto Regional Engineering Excellence Award, 2011 Virginia Regional Finalists, 2011 Virginia Regional Industrial Design Award, 2011 Virginia Regional Woodie Flowers Finalist Award, 2011 Virginia Regional FIRST Dean's List Award and was the 2011 Robot Rumble Champions.

Triple Helix is sponsored by the U.S. Army Research Laboratory, NASA, The Boeing Company, Jacobs Engineering ROME Group, Booz-Allen-Hamilton, BAE Systems Norfolk Ship Repair, JCPenney, ZelTech, Analytical Mechanics Associates, Jack and Jan Lythgoe, Eagle Technologies, and Engineered Rugged.

FIRST is an international organization with the ambitious mission of transforming modern culture by celebrating science and technology and encouraging more students to be interested in pursuing education in Science, Technology, Engineering and Mathematics (STEM).

Quick Look: check out a game animation at www.team2363.org/mobile

The Triple Helix entry, Genome Delta, can be viewed at www.team2363.org/mobile.

BUILDING FOR TOMORROW: ARL MENTORSHIP IN ROBOTICS INSPIRES YOUTH, EMPLOYEES ALIKE

Triple Helix team member prepares robot for October's Robot Rumble Competition. The ARL-sponsored team from Menchville High School, Va., won the challenge with help from VTD mentors. (Courtesy photo)

Jan. 5, 2010

In a dramatic come-from-behind victory, an ARL-sponsored high school robotics team won an off-season competition in Virginia in October and cemented its reputation as a true contender in the upcoming 2010 For Inspiration and Recognition of Science and Technology (FIRST) Robotics Competition season, which will kick off on Saturday, Jan. 9.

The FIRST competition is designed to inspire high school students to become engineers by giving them real-world experience working alongside professional engineers in developing a robot.

"I would have to place my mentorship of a FIRST Robotics Competition team as one of the most satisfying of my career," said Matt Wilbur, team leader in the Mechanics Division of ARL's Vehicle Technology Directorate at Langley, Va. Wilbur, who volunteers as the team's head coach and fabrication mentor, added that "(e)very year there has been at least one student that you can tell has clearly turned the corner in their life because of their involvement in FIRST."

Wilbur and other ARL mentors led the FIRST Robotics Competition team, Triple Helix, from Menchville High School in Newport News, Va., to participate in the off-season event, the Robot Rumble, at the Virginia State Fair. The team finished the qualification matches and seeded fourth out of 14 teams, then went on to win the championship during the elimination tournament. ARL mentors included Chester Langston, an electronics engineer in the Mechanics Division; Yolanda Hinton, a mechanical engineer who serves as an ARL technical assistant to the director; and ARL retiree Bill Yeager, an aerospace engineer.

Wilbur helped start Triple Helix as team sponsor in 2007. He had been volunteering as a supporter of the NASA Knights, another team in the competition.

ARL-sponsored team, Triple Helix, of Menchville High School, Va., discusses competition strategy in October during the Robot Rumble, a competition VTD's Matt Wilbur and others helped them come from behind to win. (Courtesy photo)

"I felt that expanding with an additional team in the area was a really good idea, so I jumped on it," he said.

Wilbur explained that the team's name derives from the double helix of human DNA. The team added the third helix as a physical representation of the type of roller chain often used in the robots, particularly in the drive train.

"The significance of the three helices intertwined is the merger of human DNA with robot DNA to form a better, more capable and powerful organism featuring the best of both human and robot characteristics," Wilbur noted. "In effect, our team represents a super-organism combining human and machine."

The team is currently comprised of 18 students; three juniors, 10 sophomores and five freshmen. It meets year-round, although their schedule slows down significantly in the summer. In the early autumn, the team meets for two hours after school. Financial relief is available to students who cannot meet the financial burden of membership. As winter approaches, the team meets once a week to prepare for the build season. Once the competition is announced, the team meets on Monday, Tuesday, and Thursday evenings for three hours, and on Saturday for nine hours.

"The FIRST Robotics Competition is a high-energy competition with the look and feel of a sporting event," Wilbur explained. "We try to start off with some type of small-scale robot competition amongst the students to get the juices flowing. Then we transition into the mode where we are preparing for the Robot Rumble off-season competition at the Virginia state fair."

By the fall, the robot has been dormant for several months without any significant use, and all of the systems need to be checked out, Wilbur noted. The team will often make upgrades, which introduces the new students to the robot.

Come January, students will begin working to design, build, program, and debug a robot. The grueling 45-day competition period ends with the robot being crated and shipped to a storage facility where it awaits competition.

Once the competition season ends, ARL mentors and advisors work with students to review performance and develop a set of lessons learned so they do not repeat mistakes in subsequent years.

Another major component of team involvement is community outreach. In November, the team participated in a carnival at the Preschool for the Education of the Exceptional Preschooler (PEEP). PEEP, an elementary school in Newport News, is dedicated to the education of children with physical and mental disabilities. Wilbur indicated that nine students and two mentors representing Triple Helix assisted at the carnival. In the spring, they volunteer as costume aids for exceptional students performing in PEEP's annual variety show.

Some team members go on to pursue scientific and technical education after graduating from high school. Since 2007, the team has graduated five seniors. Two went into technical career fields, and one 2009 graduate is majoring in electrical engineering at Virginia Commonwealth University in Richmond, Va. In addition, many of the current team members are considering four-year education at technical universities, and as participants in FIRST, some may qualify for its scholarship funding, which now tops $12 million.

In many ways, continued student interest in science and technology is a testimony to ARL's involvement in the program.

"ARL's interest is in ensuring that students get the chance to find out what great fields science, math, and technology are," said Wilbur. "I would not be surprised if ARL hires someone over the next few years that came up through one of the ARL-sponsored FIRST teams when they were in high school."

MENTORING MATTERS

ARL'S LAUNCH OF FIRST JUNIOR LEGO LEAGUE COMPETITION IN HARFORD COUNTY CHANGES STUDENTS' LIVES

Jadon Russell, Mackenzie Klepsig and Lily Altshuler of the Churchville LEGObots display their model of a lollipop that can take a child's temperature or administer medication. (ARL Photo by T'Jae Gibson)

March 17, 2011

CHURCHVILLE, Md. -- When Churchville Elementary School student Mackenzie Klepsig was just four years old, her parents noticed that something was wrong with the way her body regulated heat. So they took her to John Hopkins hospital for weeks of tests, including an echocardiogram; all tests eventually ruled out thyroid and rheumatology problems.

Her diagnosis was an anomalous right coronary artery, a condition where both coronary arteries originate from the left side of the heart instead of one from each side, said her father Ken, and can pinch closed when under stress or activity. That's why he and his wife jumped at the opportunity to sign Mackenzie up for the ARL-sponsored Junior First Lego League team, the first in Harford County, Md., hosted at her school.

"Because of the physical limitation we place on Mackenzie, we push her to develop her mind," he said. He along with four other volunteers including ARL's Dr. James Snyder, from the Weapons and Materials Research Directorate, and Dr. Matt Floros, from the Vehicle Technology Directorate, serve as coaches to four teams of about four students each in first through third grades.

Seven-year-old Jadon Russell looks over the model his team created to help children take medicine they need when they're sick. Their Lollipop Thermometer comes with a re-useable thermometer base and quick-dissolving flavored medicine. (ARL Photo by T'Jae Gibson)

The teams meet weekly in Churchville Elementary's cafeteria for about 90 minutes working on projects and inventions related to biomedical technology. Snyder said the teams were initially formed in October for only six weeks, but on February 26, some six months later, these teams competed in an area-wide Jr. First Lego League Expo at the University of Maryland, Baltimore County Retriever Activities Center.

More than 30 regional teams participated in the non-competitive competition, Snyder said, emphasizing to parents and students that competition rules really served as guidance, and that each team would be awarded a trophy.

Nine-year-old Nicholas Kendall and eight-year-old Julia Snyder, both of "Team Brickmaster", demonstrate how their Alzheimer's Machine operates. The project was built around a memory scanner to help people with Alzheimer's disease recover lost memories, recognize loved ones, and function normally. (ARL Photo by T'Jae Gibson)

ARL-sponsored team LEGO Machiners won the Body Builders award for the mechanical arm they developed using LEGOs. Team Brickmasters, coached by Snyder, won the Engineering Excellence award for their Alzheimer's Machine, and the LEGO Masters, coached by Floros, won the Super Builders award for their flying hospital. Klepsig's team, LEGObots, won the Got Guts award for their lollipop invention.

The Junior First Lego League is the newest offering of the First Robotics Program, which started in 1989 in New Hampshire to help young people discover and develop a passion for science, engineering, technology, and math.

Modeled after FIRST LEGO League, which is geared toward students in grades 4-8, the Junior First Lego League was formed in 2004 to introduce the youngest, budding scientists to science and technology. The junior competition, like others in the First family of programs, features a real-world challenge to be solved by research, critical thinking and imagination. Guided by adult coaches, students work with LEGO elements and moving parts to create solutions and present them for review.

The heart of “Team Brickmaster”’s Alzheimer’s Machine, a brain scanner that extracts memories from people for storage and can reinsert them at a later time. Patients with Alzheimer’s disease may use the machine repeatedly to recover lost memories and capabilities. (ARL Photo by T’Jae Gibson)

Eight-year-old “Lego Masters” Athena Floros, daughter of VTD’s Matt Floros who serves as her team’s coach, and Meghan Reed rehearse their presentation for their project, the Helping Hands Hospital. The mobile hospital can self-deploy to remote disaster areas where large numbers of injured people and infrastructure damage hamper local hospitals. (ARL Photo by T’Jae Gibson)

Eight-year-old “Lego Master” Meghan Reed demonstrates the model of a flying mobile hospital her team created to assist in disaster-stricken areas. The idea was based on combining a truck-transported mobile hospital with a medical evacuation helicopter to create the Helping Hands Hospital. (ARL Photo by T’Jae Gibson)

The Lollipop Thermometer, created by Churchville LEGObots team members Mackenzie, seven-year-olds Jadon Russell, second grade, and Lily Altshuler, first grade, relies on a re-useable thermometer as the “stick” in its lollipop design, and quick-dissolving medicine or candy as the sweet centerpiece. If a parent is not sure if the child is sick or not, the parent would simply take the child’s temperature with a candy lollipop - without medicine - to get a reading of at least body heat.

Once the diagnosis is clear, parents and children can choose a variety of flavors to address different ailments. For example, if the child has a cough, he or she would use the red, or cherry-flavored lollipop. For congestion, use the blue lollipop that is berry flavored. In cases of multiple symptoms, commonly found with the flu, the multi-colored lollipop would be used.

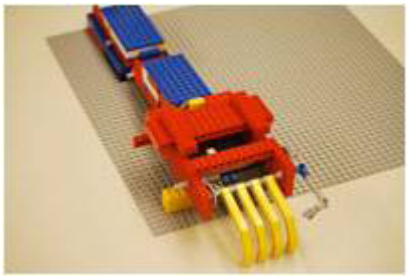
“The Lollipop Thermometer works just like a regular thermometer. You place the lollipop in the child’s mouth; it would not need to go under the tongue,” Mackenzie explained during a recent dry-run of the presentation. “When the lollipop dissolves, sensors would pick up the temperature and it would read out on the lollipop stick.

“In our model, we are using the motorized movement of a chain to simulate the rise and fall of body temperature,” said the seven-year-old. “In our model, the battery powered motor turns an axle that is connected to a gear. The chain is connected to the gear and is also connected to a free moving gear and axle at the other end. It works just like a bicycle chain.”

Mackenzie’s father Ken said during his daughter’s latest round of tests at Johns Hopkins, she mentioned her team’s Lego project to the doctors. “They seemed to think it was an excellent idea. Anything that makes it easier for doctor to administer medicines to pediatric patients is a welcome treat for doctors. We were told that some transplant patients take upwards of 15-20 medicines and having them eat a lollipop would make taking medicine a more pleasant experience.”

According to Snyder, ARL plans to continue supporting the competition for another year, and is looking to start First Lego League teams with fourth and fifth graders.

“We were very excited when the formation of a Lego Robotic program was announced at Churchville Elementary School,” said Ken Klepsig. “We whole-heartedly support the program. We are also very thankful for ARL for their support as well. ARL’s contributions were a great help to families that already have their finances stressed from other causes. The Lego program is now funded fully by the participant and ARL.”



BASE REALIGNMENT AND CLOSURE FACILITIES

STAKEHOLDERS GATHER TO SIGN FINAL STEEL BEAM FOR NEW VTD FACILITY

VTD employee Stephen Wilkerson participated in the ceremonial signing of the final beam. The last piece of steel is going to be placed on the building at time and date in the near future.

May 3, 2010

A group of stakeholders in the construction of the new VTD facility met on April 15 at APG for an informal signing of the building's final steel beam.

The facility's purpose will be to research, develop, test, and evaluate across multiple disciplines including propulsion, structure, aeroelasticity and autonomous control of air and ground vehicle systems. It is located behind the Rodman Laboratory and is expected to be completed by May 2011.

Representatives from the Army Corps of Engineers and contractor Walbridge Aldinger attended the ceremony. ARL's Mark Nixon, director of VTD, and Gary Klann, Base Realignment and Closure facility lead, were also present to discuss the progress of the VTD facility.

Michael Cygan, project manager for Walbridge, the primary contractor, estimates that one-third of the project is already complete, and it is scheduled to be finished by the deadline. The steel portion of construction began in January, and the team will continue to work towards completion by adding unique concrete blast walls and other distinctive features.

"We had some challenges to overcome with the snow this past winter, but we are moving forward and have overcome any challenges from the bad weather," Cygan said. "We are working hard with the subcontractors to ensure that our work is nothing short of high quality."

The ceremonial last section of steel beam was signed by construction workers, ARL employees, and other stakeholders.

The Walbridge construction crew continues work on the VTD building. The facility is scheduled for completion in May 2011.

When VTD employees relocate from NASA-Glenn and NASA-Langley, they will have new and improved opportunities with their new facility, said VTD Director Dr. Mark Nixon.

"The site at APG will have customized, unmanned systems," he said. "We will have a better utilization of space without having to worry about making use of other facilities. This allows scientists to leave long-term experiments in the lab and not have to worry about time constraints."

According to Nixon, the new building will greatly benefit the directorate's mission. New specialized equipment will be brought in and the overall way scientists are able to approach their projects will be improved.

CONTRACT FOR THE HEAT ENGINE SYSTEMS ALTITUDE TEST FACILITY SYMBOLIZES PROGRESS

A computer generated illustration shows what the outside of the new VTD facility will look like upon completion.

June 25, 2010

As Base Realignment and Closure progresses, ARL's ability to initiate and develop future scientific discoveries grows stronger. As part of the BRAC legislation, a new facility for VTD is under construction at APG. Recently, a design-build contract for the Heat Engine Systems Altitude Test Facility was awarded and will serve as one of six major components in the VTD facility upon completion.

The contract for the HESATF was awarded this past May 4.

The HESATF will have multi-component capability consisting of an altitude engine test chamber and equipment necessary to supply air to the chamber, create altitude conditions and remove exhaust. There will also be systems in place to simulate air craft power loads and rotor blades for helicopters.

According to Gary Klann, who works for VTD at NASA Glenn, creating the necessary simulated flight conditions in this facility requires the use of specialized air handling systems that provide exact dryness levels, pressures and temperatures.

The facility will include a computerized facility control and monitoring system where everything will be operated locally from an adjacent reinforced control room located within the facility, Klann noted. "The bottom line is that the engines and propulsion systems operated in this facility will 'think' they are operating under actual flight environments."

When the overall VTD building construction is complete, the building will house five other major laboratories specializing in flow physics, integrity and durability, mechanical components, high temperature and universal drive. The new HESATF will be located within the Engine Components and Engine Systems laboratory.

The HESATF will further enhance ARL's ability to continually research, develop, test and evaluate across multiple disciplines including propulsion, structure, aeroelasticity, and autonomous control of air and ground vehicle systems.

VTD Director Dr. Mark Nixon said the overall facility at APG will be a cost saving measure and greatly augment the mission of the directorate.

"The Propulsion Systems Lab at NASA Glenn provides the Army's only access to ground-based test facility capable of true flight simulation for experimental research on air-breathing propulsion systems," he said. "The new facility at APG will have similar capabilities to that of the PSL, but will be tailored to smaller engines and will be more cost effective for both basic and applied research in this technical area."

The new VTD facility will be located behind the Rodman Laboratory and is expected to be completed by May 2011.